

# The BTeV Conceptual Design Report

This report is substantially the same as the “BTeV Proposal Update”, submitted to Fermilab in May of 2002. This “Update” represented a descoping of the original BTeV proposal, submitted to Fermilab in May of 2000 after many years of discussion, preparation, and interaction with the Fermilab management and with the Fermilab Program Advisory Committee (PAC). Fermilab approved the original proposal at the end of June 2000. The purpose of the descoping in 2002 was to reduce the cost of the experiment, which was considered to be an issue by the HEPAP Subpanel on Long Range Planning. To save money the detector has only one arm as compared to two in the original proposal.

In the year that has passed since the “Update” was written, Fermilab has conducted a technical and cost review of BTeV (October 2002), R&D has continued, the physics case has continued to be developed, an effort to prepare a complete resource loaded cost and schedule is underway, and many technical designs have advanced to a new level of detail. The group is preparing to incorporate all the recent progress in a “Technical Design Report (TDR)”. However, the “Update” continues to provide the complete conceptual design for proposed detector except in three respects:

- the mechanical support and cooling of the silicon pixel detector. The technical design has changed significantly in the last year due to concerns raised in the October 2002 review;
- the cost estimate was also reviewed by Fermilab in the October 2002 review. The new estimate, which is only about 7% higher than the original, reflects fully the findings and recommendations of the committee; and
- the physics case has changed with the input of more theoretical ideas and also new data from the  $e^+e^-$   $B$ -factories. Most of this new material is contained in our answer to one of the questions of the P5 HEPAP subpanel and can be found at <http://www-btev.fnal.gov/cgi-bin/DocDB/ShowDocument?docid=1618> . Some material in the Physics Case chapter has been updated as well.

The physics sensitivities were updated in May 2002 to reflect the single arm configuration. Comparisons with other experiments reflect their calculations at the time. Since then, LHCb has undergone a massive redesign and their latest sensitivities are only now beginning to appear. We also have been told that the Tevatron will now run at a bunch separation of 396 ns rather than 132 ns. A recent set of calculations demonstrate that this changes BTeV’s sensitivities in a mode dependent manner, up to 15% in the number of signal events in the worst case.

Despite the obviously fluid situation, the BTeV design has changed little from the “Update” except for the items mentioned above. The pixel description in the CDR is the same as the one appearing in the “Update” and does not reflect the recent changes to the design. The CDR does include the updated cost estimate for the one-arm system based on input from the October 2002 review. The revised mechanical and cooling system for the Pixel

detector and the most recent cost estimates, which were undertaken at the end of 2003 and show no significant change in the total cost, will be presented in the TDR.